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THE OCCURRENCE OF HEMOLYTIC STREPTOCOCCI IN THE NORMAL THROAT

DAVID J. DAVIS

From the Department of Pathology and Bacteriology, University of Illinois, College of Medicine, Chicago

The incidence of hemolytic streptococci in the throat has been studied by many workers. In normal persons the percentages as given range from 10 to 60 per cent. or higher. From the mass of literature on this point I think the impression may be gained, indeed the conclusion has been drawn by some, that this organism does not occur in the throats of some persons. Others have the impression that certain persons are definite carriers in that they constantly harbor large numbers of the organisms in the throat.

The data have been obtained in most instances by making ordinary throat swabs and then plating either by the poured plate method or by surface plate smears. These methods will determine with reasonable accuracy the incidence of hemolytic streptococci on the surface of the mucosa of the throat. It is now known, however, that hemolytic streptococci prefer to inhabit the crypts and grooves of tissues about the throat. In the crypts of the tonsils Pilot and Davis¹ have shown that they are found in nearly 100% of cases, and others have obtained substantially the same results. Pilot,² recently has also shown that in the folds of the adenoids these organisms are found in about 60% of cases. The surface flora and the crypt flora, therefore, are by no means alike.

The fact that in the crypts of nearly 100% of tonsils these cocci are found would clearly suggest that probably every one would have them on the mucosa at times; but I know of no definite data on this point. In order to determine whether or not this is true the following experiments were made:

Throat cultures from groups of normal adult persons were obtained. Swabs were made by firmly pressing a cotton applicator against the pharyngeal mucosa and also over the surface of the palatine tonsils when present. They were then

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¹ Jour. Infect. Dis., 1919, 24, p. 386.

² Ibid., 1921, 29, p. 62.

immersed in melted blood agar and poured plates made, using proper dilutions. After 24 and 48 hours the plates were examined and suggestive colonies picked and submitted to confirmatory tests.

First the throats of a group of 15 normal persons (medical students) were examined as described; 5 or 33⅓%, gave positive results. Two weeks later a second examination was made of the same persons; 10, or 66⅔%, yielded positive cultures. Three of those yielding negative cultures were negative at the first examination of the group. Two weeks later a third examination of the same group was made and 9, or 60%, were positive. The three negatives mentioned were now positive. In the period of one month, therefore, at one time or another each of the group had hemolytic streptococci in his throat. Four gave positive results on all three examinations.

In a second group of 15 students, all different from the first group, similar tests were made but at shorter intervals. In the first test 7, or 46.6% gave positive results. After 5 days cultures were again taken from the 8 who gave negative cultures, and 3 of these were now positive and 5 still negative. One week later, cultures were again taken from the 5 who had yielded negative cultures, and 4 were positive. A culture was taken 2 weeks later; from the one remaining, who had given 3 successive negative cultures a positive culture resulted. As in the preceding series, all the persons therefore had hemolytic streptococci in their throats at some time during a relatively brief interval. Both of these series of examinations were made during Dec. and Jan., 1920-21.

Cultures were taken from a third group of 15 students in May, 1921. In the first examination 8, or 53.3%, of the 15 gave cultures of hemolytic streptococci. Ten days later 8 of the 15 gave positive cultures, but the persons were different from the first 8. Three of these who gave cultures were negative at the first examination. Eight days later these 3 negatives yielded a positive result in a third examination.

In summing up the results of these 45 examinations made 3 or more times at varying intervals, it will be seen that all at some time during an interval of about 1 month showed the presence of hemolytic streptococci in the throat. Probably they might all have been positive in a shorter time had more cultures been taken at shorter intervals. The percentages positive of the different groups varied from 33 to 66.

Nine of the 45 persons examined had had their tonsils removed months or years previously. In the first examination 3 of the 9 gave positive cultures of hemolytic streptococci; in the second examination 4 of the 9 yielded positive cultures. Of the 6 negatives in the first series, 3 were positive in the second examination. A third examination yielded 5 positives. Only one person gave negative cultures in the 3 tests. It was not possible to make further examinations on this person.

In these tests the number of streptococci in the plates were noted in relation to the other organisms. On the whole, they were few, and at times only one or two colonies appeared. Roughly, they comprised

from 1 to 10% of all the colonies that grew. One or two interesting exceptions appeared which were easily explained. One young man at work in the laboratory was feeling quite normal when the culture was taken. A cursory examination of his throat did not reveal an abnormal condition. The culture yielded an abundant almost pure growth of highly hemolytic streptococci. In 24 hours he was quite ill with fever, headache, malaise, and a red throat with fine white spots on his tonsils—a typical streptococcus sore throat. In another person the plate culture of the throat yielded between 60 and 70% of widely hemolytic streptococcus colonies. Inquiry revealed the fact that a few days before he had been ill with a cold and sore throat. The throat was fairly normal, but the tonsils were somewhat inflamed.

On the whole, the cultures from the tonsillectomized persons contained fewer hemolytic streptococci than those from persons with tonsils. There were exceptions to this, however; and in relation to incidence in this series there was little difference in the percentages in the two groups. According to previous observations of Pilot and Davis¹ and of others, the incidence of hemolytic streptococci in persons without tonsils is decidedly less than in those with them.

The streptococci isolated appeared to be the ordinary hemolytic variety of the human type. They were gram-positive, spherical or slightly oval cocci, some growing in short chains, others in moderately long ones. They were not encapsulated. On blood they caused a wide, clear and complete zone of hemolysis from 2 to 4 cm. wide. They grew practically not at all at room temperature, and best at 37 C. In plain broth they developed poorly but more profusely when dextrose or body fluids were added. They were no doubt the ordinary hemolytic *Streptococcus pyogenes* of the human type.

The streptococci obtained in ordinary throat swabs would appear to come from two sources. No doubt some arise from the relatively large numbers of these cocci that constantly inhabit the crypts and folds of the tonsillar and other tissues of the throat. The grooves about the teeth also not uncommonly harbor moderate numbers as Kordenat has shown. Then again a certain number appear to grow on or in the mucosa of the throat in the normal as well as in the pathologic state, as indicated by the positive cultures in the tonsillectomized persons. Presumably the latter are few, but it is difficult to

estimate exactly how numerous they may be because of the possible discharge of the same cocci from the grooves and pockets first mentioned.

SUMMARY

Cultures taken at short intervals sooner or later reveal the presence of hemolytic streptococci in the throats of practically all normal adult persons.

The cocci as revealed by throat swabs are not numerous; far less according to our experience than in the crypts of tonsils or adenoids.